CHAPTER 3

WATER QUALITY ASSESSMENT OF THE NONCONNAH CREEK WATERSHED

3.1 BACKGROUND. Section 305(b) of The Clean Water Act requires states to report the status of water quality every two years. Historically, Tennessee's methodologies, protocols, frequencies and locations of monitoring varied depending upon whether sites were ambient, ecoregion, or intensive survey. Alternatively, in areas where no direct sampling data existed, water quality may have been assessed by evaluation or by the knowledge and experience of the area by professional staff.

In 1996, Tennessee began the watershed approach to water quality protection. In the Watershed Approach, resources—both human and fiscal—are better used by assessing water quality more intensively on a watershed-by-watershed basis. In this approach, water quality is assessed in year three, following one to two years of data collection. More information about the Watershed Approach may be found at:

http://www.state.tn.us/environment/wpc/wshed1.htm.

The assessment information is used in the 305(b) Report (The Status of Water Quality in Tennessee) and the 303(d) list as required by the Clean Water Act.

The 305(b) Report documents the condition of the State's waters. Its function is to provide information used for water quality based decisions, evaluate progress, and measure success.

Tennessee uses the 305(b) Report to meet four goals (from 2000 305(b) Report):

1. Assess the general water quality conditions of rivers, streams, lakes and wetlands

2. Identify causes of water pollution and the sources of pollutants

3. Specify waters which have been found to pose human health risks due to elevated bacteria levels or contamination of fish

4. Highlight areas of improved water quality

EPA aggregates the state use support information into a national assessment of the nation's water quality. This aggregated use support information can be viewed at EPA's Surf Your Watershed site at http://www.epa.gov/OW/resources/9698/tn.html

The 303(d) list is a compilation of the waters of Tennessee that are water quality limited and fail to support some or all of their classified uses. Water quality limited streams are those that have one or more properties that violate water quality standards. Therefore, the water body is considered to be impacted by pollution and is not fully meeting its designated uses. The 303(d) list does not include streams determined to be fully supporting designated uses as well as streams the Division of Water Pollution Control cannot assess due to lack of water quality information. Also absent are streams where a control strategy is already in the process of being implemented.

Once a stream is placed on the 303(d) list, it is considered a priority for water quality improvement efforts. These efforts not only include traditional regulatory approaches such as permit issuance, but also include efforts to control pollution sources that have historically been exempted from regulations, such as certain agricultural and forestry activities. If a stream is on the 303(d) list, the Division of Water Pollution Control cannot use its regulatory authority to allow additional sources of the same pollutant(s).

States are required to develop Total Maximum Daily Loads (TMDLs) for 303(d)-listed waterbodies. The TMDL process establishes the maximum amount of a pollutant that a waterbody can assimilate without exceeding water quality standards and allocates this load among all contributing pollutant sources. The purpose of the TMDL is to establish water quality objectives required to reduce pollution from both point and nonpoint sources and to restore and maintain the quality of water resources.

The current 303(d) List is available on the TDEC homepage at http://www.state.tn.us/environment/water.htm and information about Tennessee's TMDL program may be found at http://www.state.tn.us/environment/wpc/tmdl.htm.

This chapter provides a summary of water quality in the Nonconnah Creek Watershed, and summarizes data collection, assessment results and a description of impaired waters.

3.2 DATA COLLECTION. Comprehensive water quality monitoring in the Nonconnah Creek Watershed was conducted in 1996 and 1997. Data were collected from 13 sites and were from two types of site: 1)Ambient or 2)Watershed.

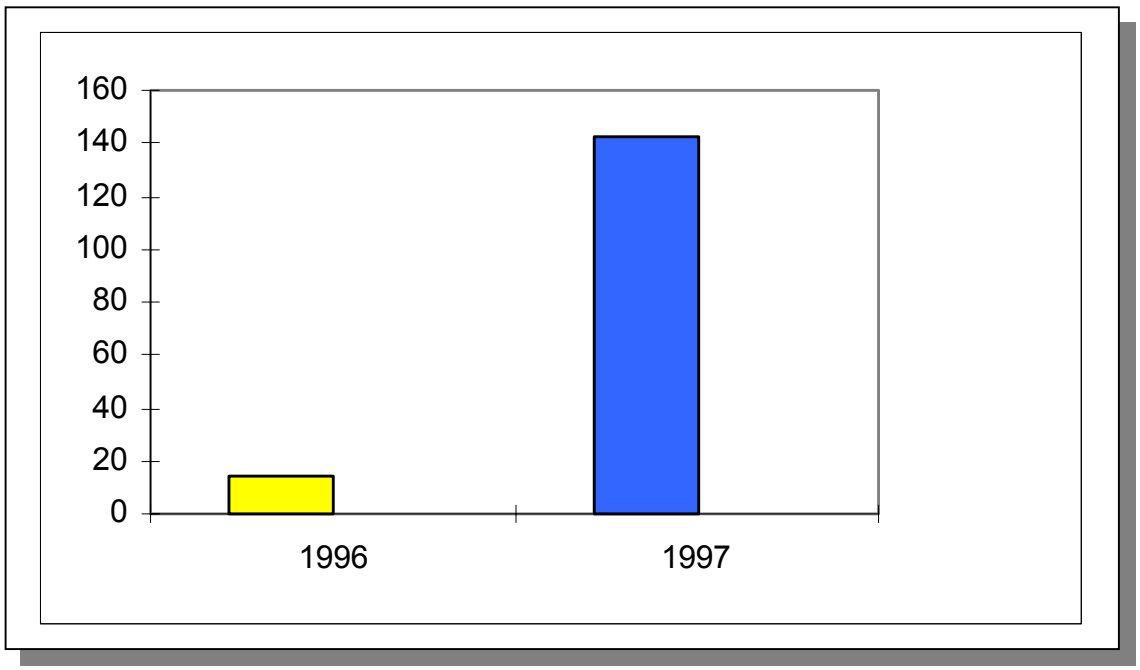

Figure 3-1. Number of Sampling Events Using the Traditional Approach (1996) and Watershed Approach (1997) in the Nonconnah Creek Watershed.

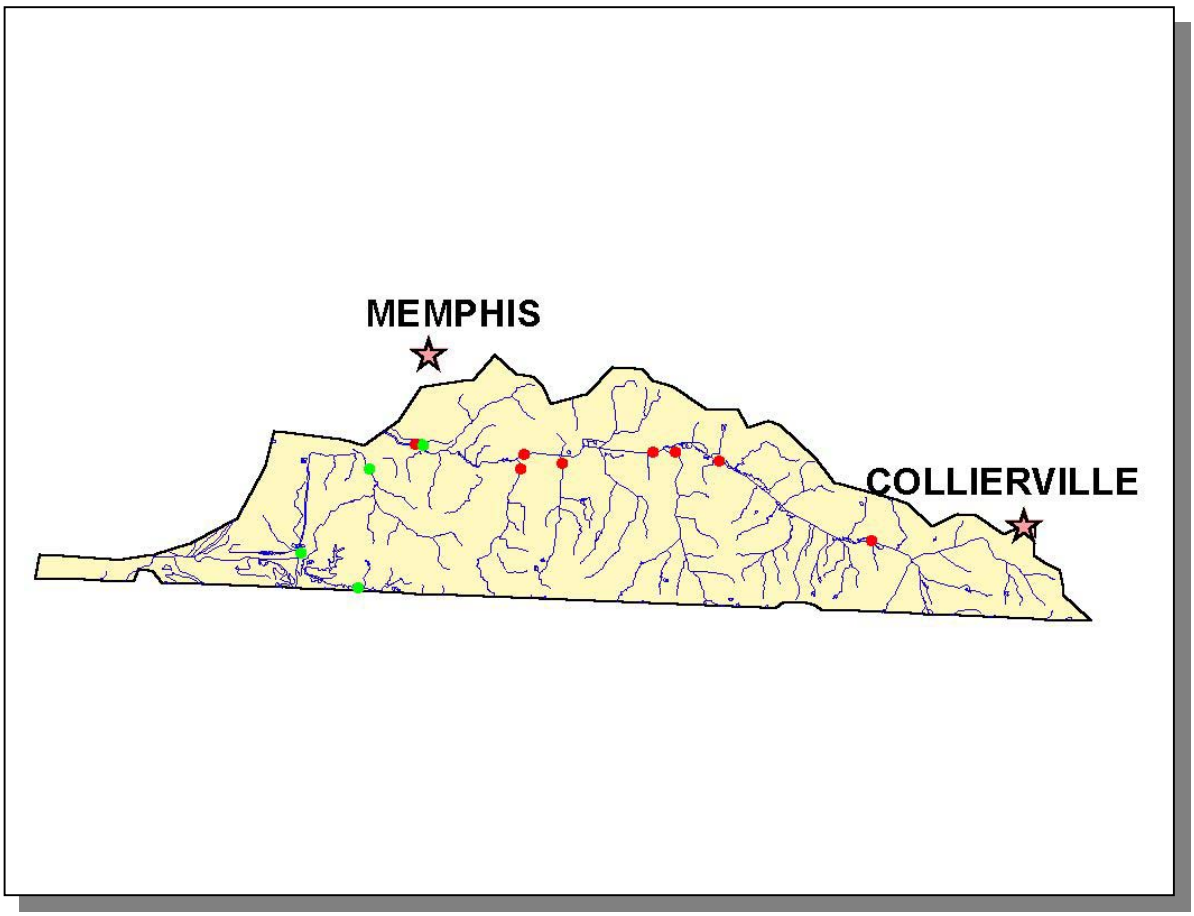

Figure 3-2. Location of Monitoring Sites in the Nonconnah Creek Watershed. *Red, Watershed Monitoring Sites; Green, Ambient Monitoring Sites. Locations of Collierville and Memphis are shown for reference.*

TYPE	NUMBER	TOTAL NUMBER OF SAMPLING EVENTS		
		CHEMICAL ONLY	BIOLOGICAL ONLY	BIOLOGICAL PLUS CHEMICAL (FIELD PARAMETERS)
Ambient	5	14		
Watershed	8	143		
Totals	**13**	**157**		

Table 3-1. Monitoring Sites in the Nonconnah Creek Watershed During the Data Collection Phase of the Watershed Approach.

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Assistance Center-Memphis Water Pollution Control staff (this is in addition to samples collected by water and wastewater treatment plant operators). Samples are analyzed by the Tennessee Department of Health, Division of Environmental Laboratory Services. Ambient monitoring data are used to assess water quality in major bodies of water where there are NPDES facilities and to identify trends in water quality. Water quality parameters measured in the Nonconnah Creek Watershed are provided in Nonconnah-Appendix IV.

Data from ambient monitoring stations are entered into the STORET (Storage and Retrieval) system administered by EPA. Some ambient monitoring stations are scheduled to be monitored as watershed sampling sites.

3.2.B. Ecoregion Sites. Ecoregions are relatively homogeneous areas of similar geography, topography, climate and soils that support similar plants and animals. The delineation phase of the Tennessee Ecoregion Project was completed in 1997 when the ecoregions and subecoregions were mapped and summarized (EPA/600/R-97/022). There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee (see Chapter 2 for more details). The Nonconnah Creek Watershed lies within 2 Level III ecoregions (Mississippi Alluvial Plains and Mississippi Valley Loess Plains) and contains 3 subecoregions (Level IV):

- Northern Mississippi Alluvial Plain (73a)
- Bluff Hills (74a)
- Loess Plains (74b)

Ecoregion reference sites are chemically monitored using methodology outlined in the Division's Chemical Standard Operating Procedure (Standard Operating Procedure for Modified Clean Technique Sampling Protocol). Macroinvertebrate samples are collected in spring and fall. These biological sample collections follow methodology outlined in the Tennessee Biological Standard Operating Procedures Manual. Volume 1: Macroinvertebrates and EPA's Revision to Rapid Bioassessment Protocols for use in Streams and Rivers.

Ecoregion stations are scheduled to be monitored as Watershed sampling sites.

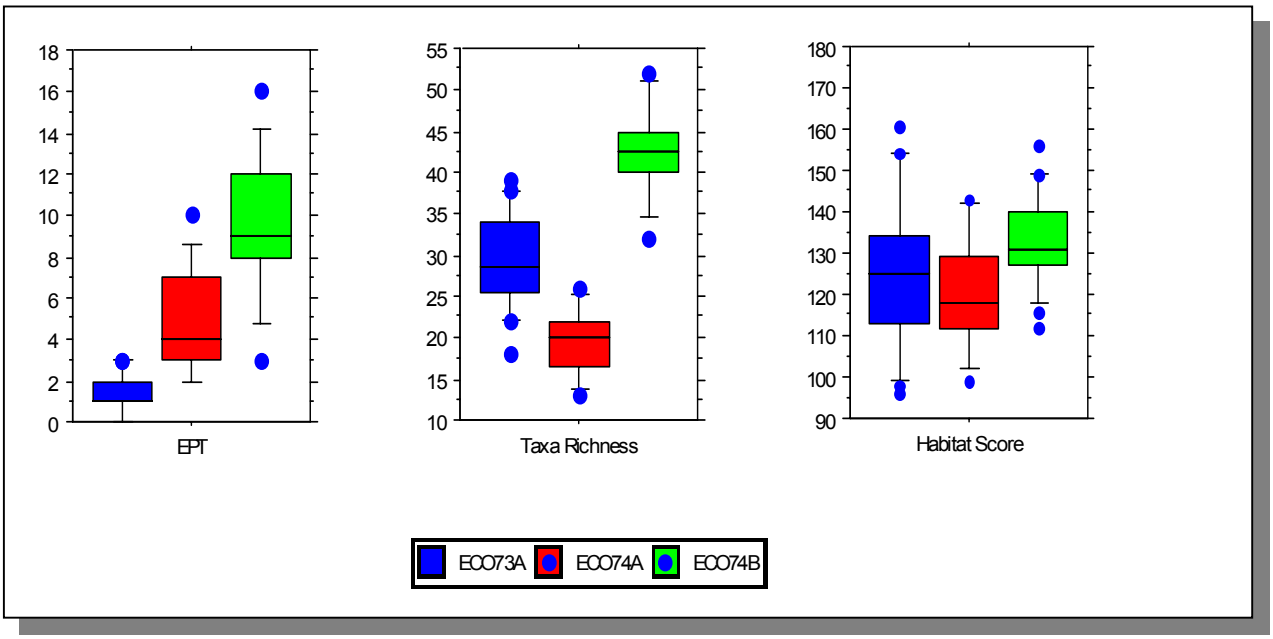

Figure 3-3. Benthic Macroinvertebrate and Habitat Scores for Nonconnah Creek Ecoregion RBP III Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. EPT and Taxa scores are number of genus observed; habitat score is calculated as described in EPA 841-D-97-002*

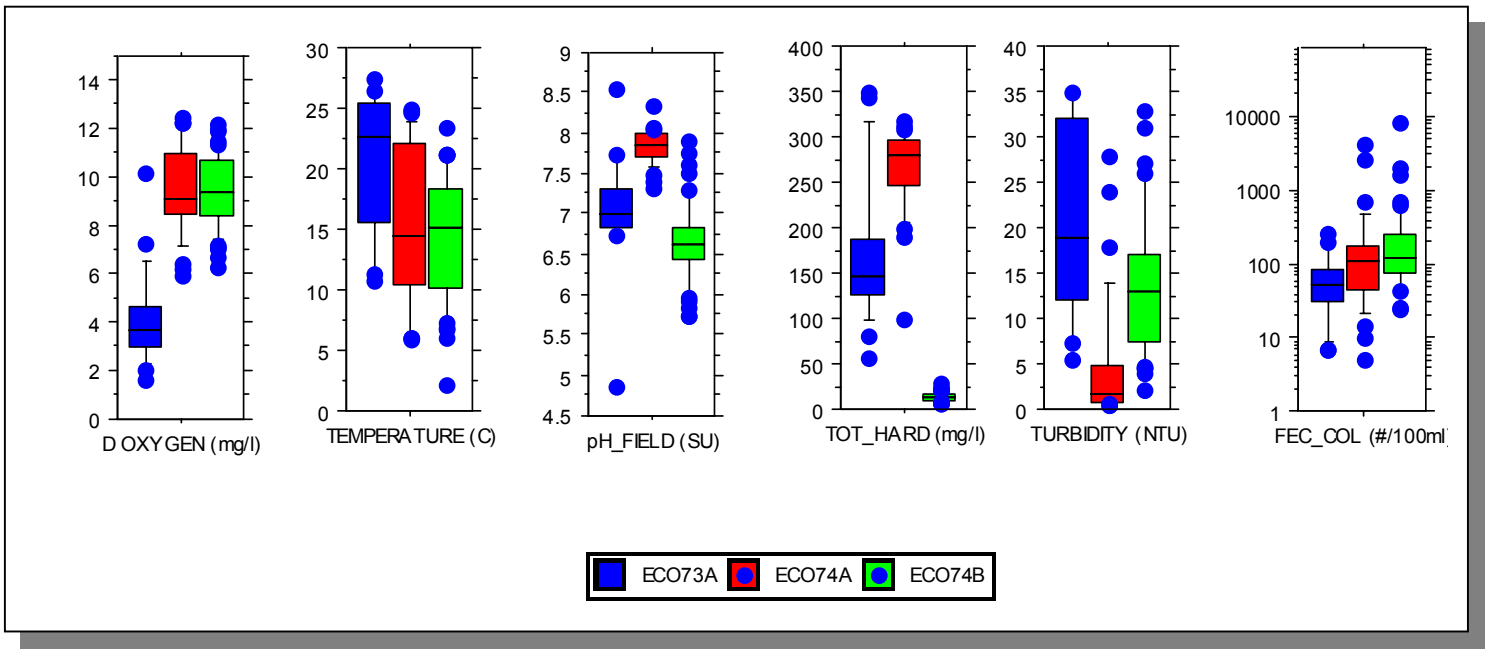

Figure 3-4. Select Chemical Data Collected in Nonconnah Creek Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots.*

3.2.C. Watershed Sites. Activities that take place at watershed sites are benthic macroinvertebrate biological stream surveys, physical habitat determinations and/or chemical monitoring. Following review of existing data, watershed sites are selected in Year 1 of the watershed approach when preliminary monitoring strategies are developed. Additional sites may be added in Year 2 when additional monitoring strategies are implemented.

A Biological Reconnaissance (BioRecon) is used as a screening tool to describe the condition of water quality, in general, by determining the absence or presence of clean water indicator organisms, such as EPT (Ephemeroptera [mayflies], Plecoptera [stoneflies], Trichoptera [caddisflies]). Factors and resources used for selecting BioRecon sites are:

- The current 303(d) list,
- HUC-11 maps (every HUC-11 is scheduled for a BioRecon)
- Land Use/Land Cover maps
- Topographic maps
- Locations of NPDES facilities
- Sites of recent ARAP activities

An intensive multiple or single habitat assessment involves the monitoring of a station over a fixed period of time. Intensive surveys (Rapid Bioassessment Protocols) are performed when BioRecon results warrant it.

3.2.D. Special Surveys. These investigations include:

- ARAP in-stream investigation
- Time-of-travel dye study
- Sediment oxygen demand study
- Lake eutrophication study
- Fluvial geomorphology

These special surveys are performed when needed.

3.3. STATUS OF WATER QUALITY. Overall use support is a general description of water quality conditions in a water body based on determination of individual use supports. Use support determinations, which can be classified as monitored or evaluated, are based on:

- Data less than 5 years old (monitored)
- Data more than 5 years old (evaluated)
- Knowledge and experience of the area by technical staff (evaluated)
- Complaint investigation (monitored, if samples are collected)
- Other readily available Agencies' data (monitored)
- Readily available Volunteer Monitoring data (monitored, if certain quality assurance standards are met)

All readily available data are considered, including data from TDEC Environmental Assistance Centers, Tennessee Department of Health (Aquatic Biology Section of Laboratory Services), Tennessee Wildlife Resources Agency, National Park Service, Tennessee Valley Authority, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Geological Survey, U.S. Forest Service, universities and colleges, the regulated community, and the private sector.

The assessment is based on the degree of support of designated uses as measured by compliance with Tennessee's water quality standards.

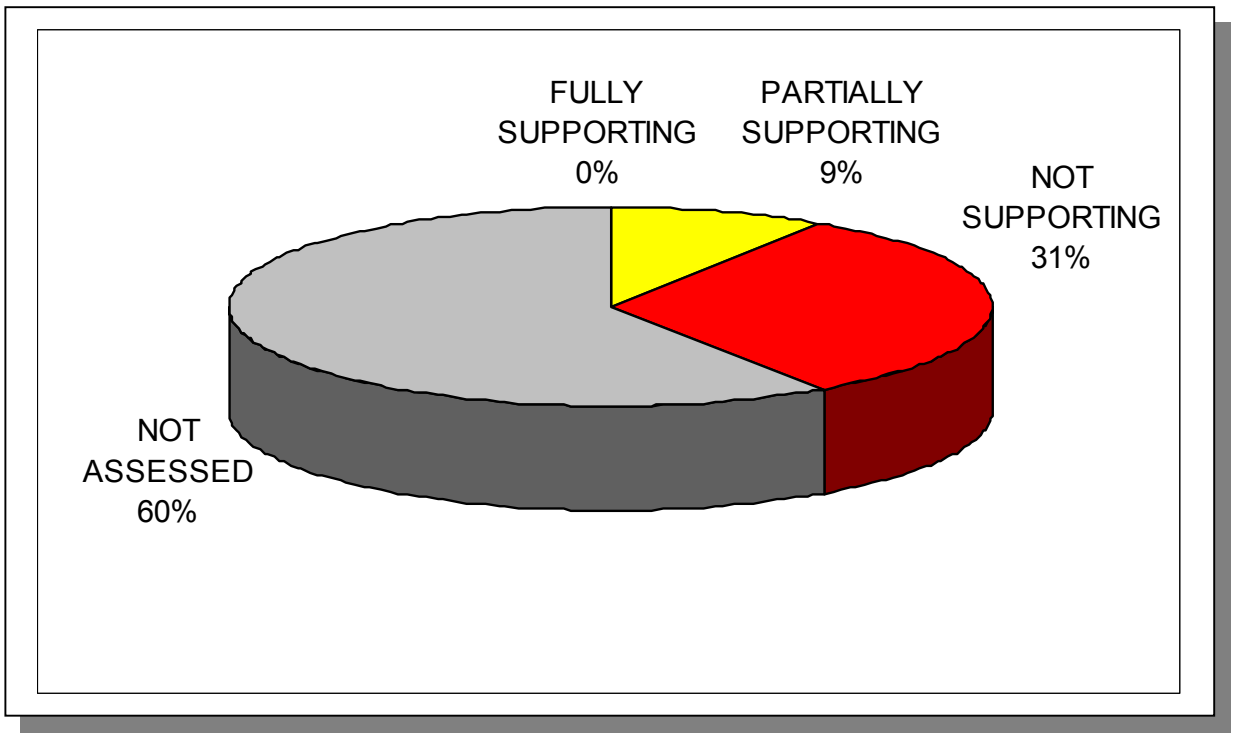

Figure 3-5. Water Quality Assessment for Rivers and Streams in the Nonconnah Creek Watershed. *Assessment data (stream miles) are based on the 2000 Water Quality Assessment*

3.3.A. Assessment Summary.

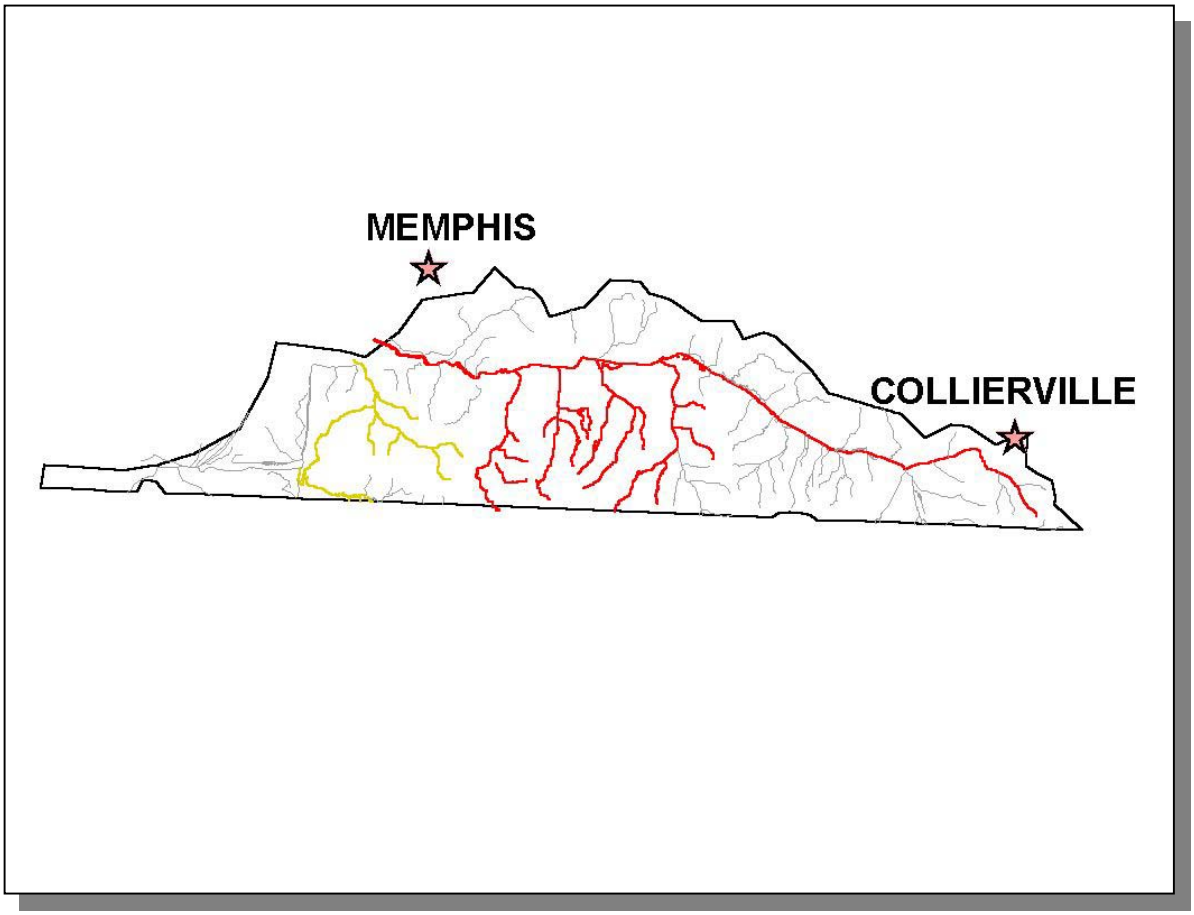

Figure 3-6a. Overall Use Support Attainment in the Nonconnah Creek Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Collierville and Memphis are shown for reference. More information is provided in Nonconnah-Appendix III.*

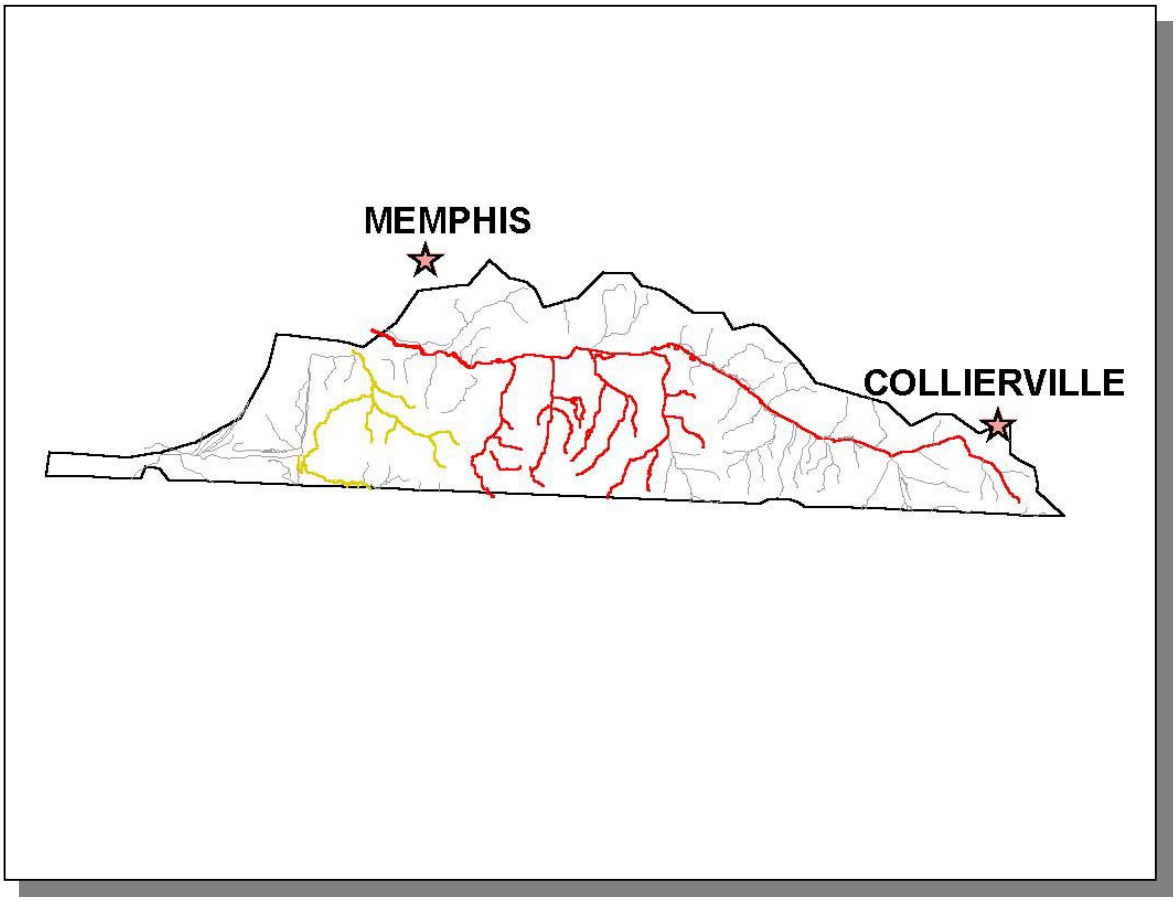

Figure 3-6b. Fish and Aquatic Life Use Support Attainment in the Nonconnah Creek Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Collierville and Memphis are shown for reference.*

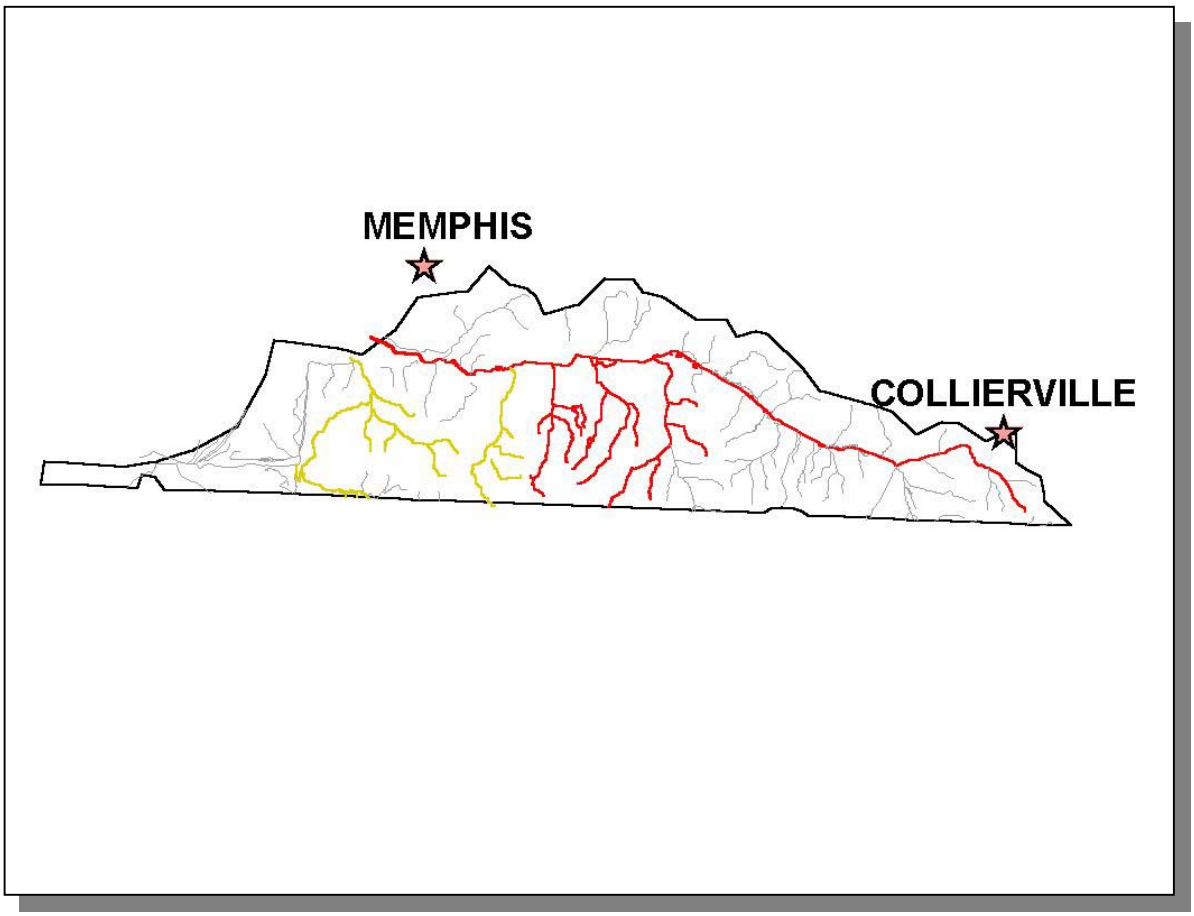

Figure 3-6c. Recreation Use Support Attainment in the Nonconnah Creek Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Red, Does Not Support Designated Use; Yellow, Partially Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Collierville and Memphis are shown for reference.*

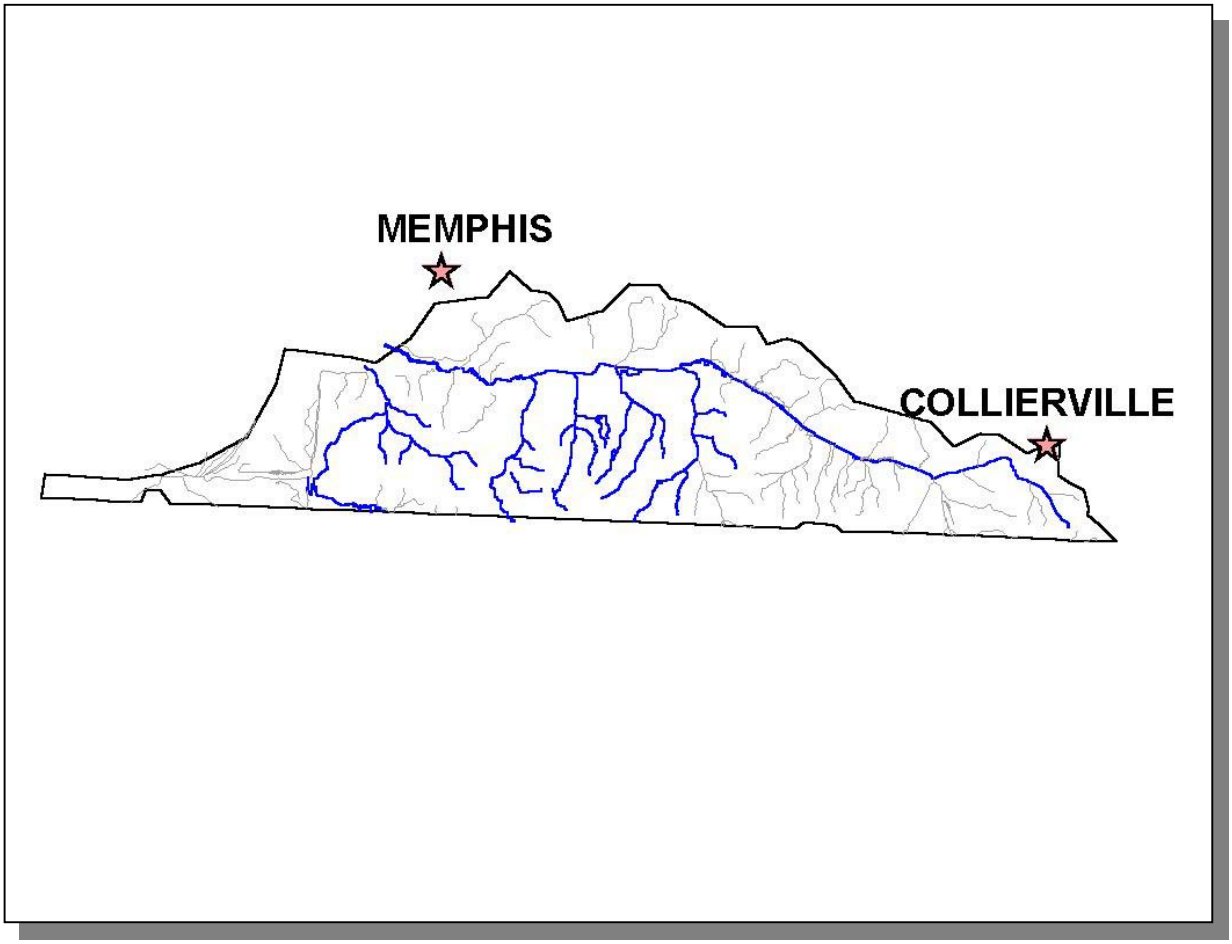

Figure 3-6d. Irrigation Use Support Attainment in the Nonconnah Creek Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Collierville and Memphis are shown for reference*

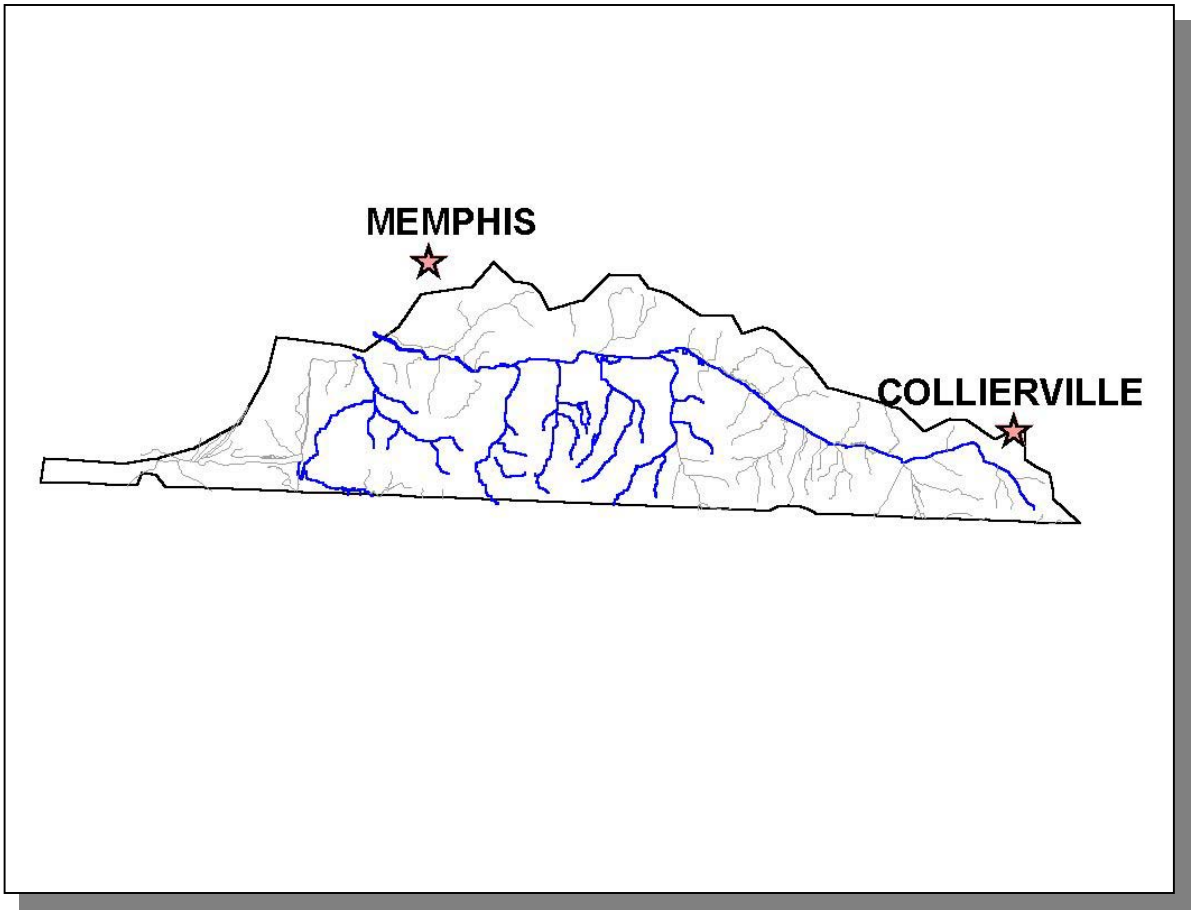

Figure 3-6e. Livestock Watering and Wildlife Use Support Attainment in the Nonconnah Creek Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Collierville and Memphis are shown for reference.*

3.3.B. Use Impairment Summary.

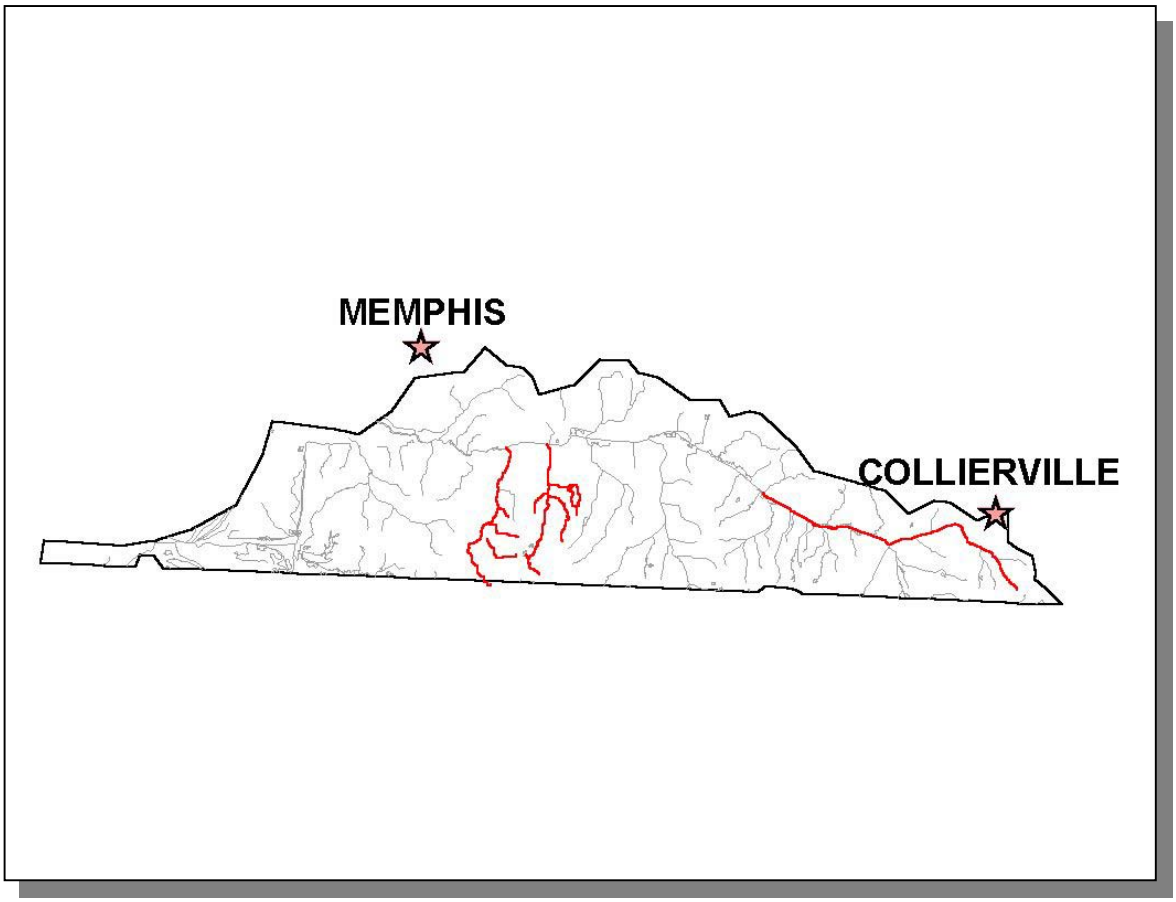

Figure 3-7a. Impaired Streams Due to Habitat Alteration in the Nonconnah Creek Watershed. *Assessment data are based on the 2000 Water Quality Assessment.; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Collierville and Memphis are shown for reference. More information is provided in Nonconnah-Appendix III.*

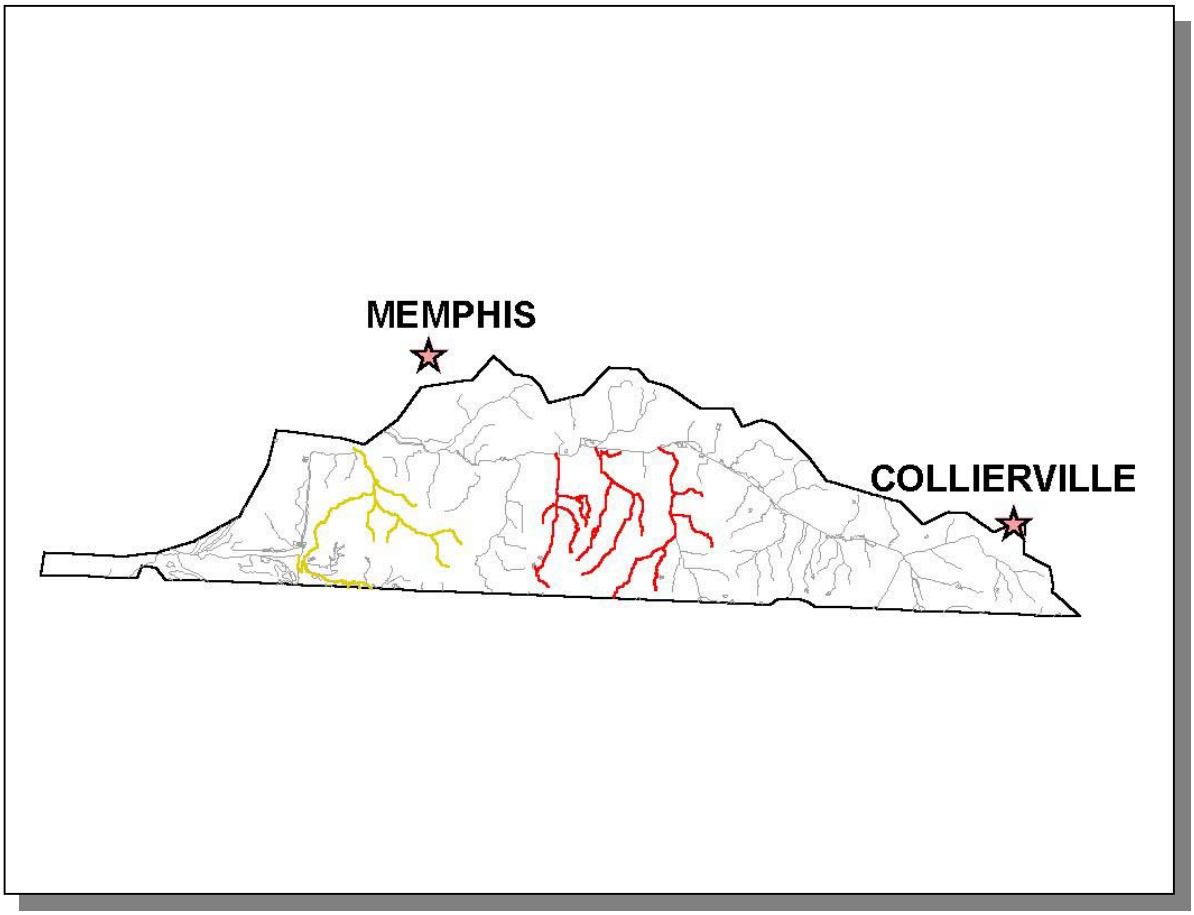

Figure 3-7b. Impaired Streams Due to Organic Enrichment/Low Dissolved Oxygen Levels in the Nonconnah Creek Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Collierville and Memphis are shown for reference. More information is provided in Nonconnah-Appendix III.*

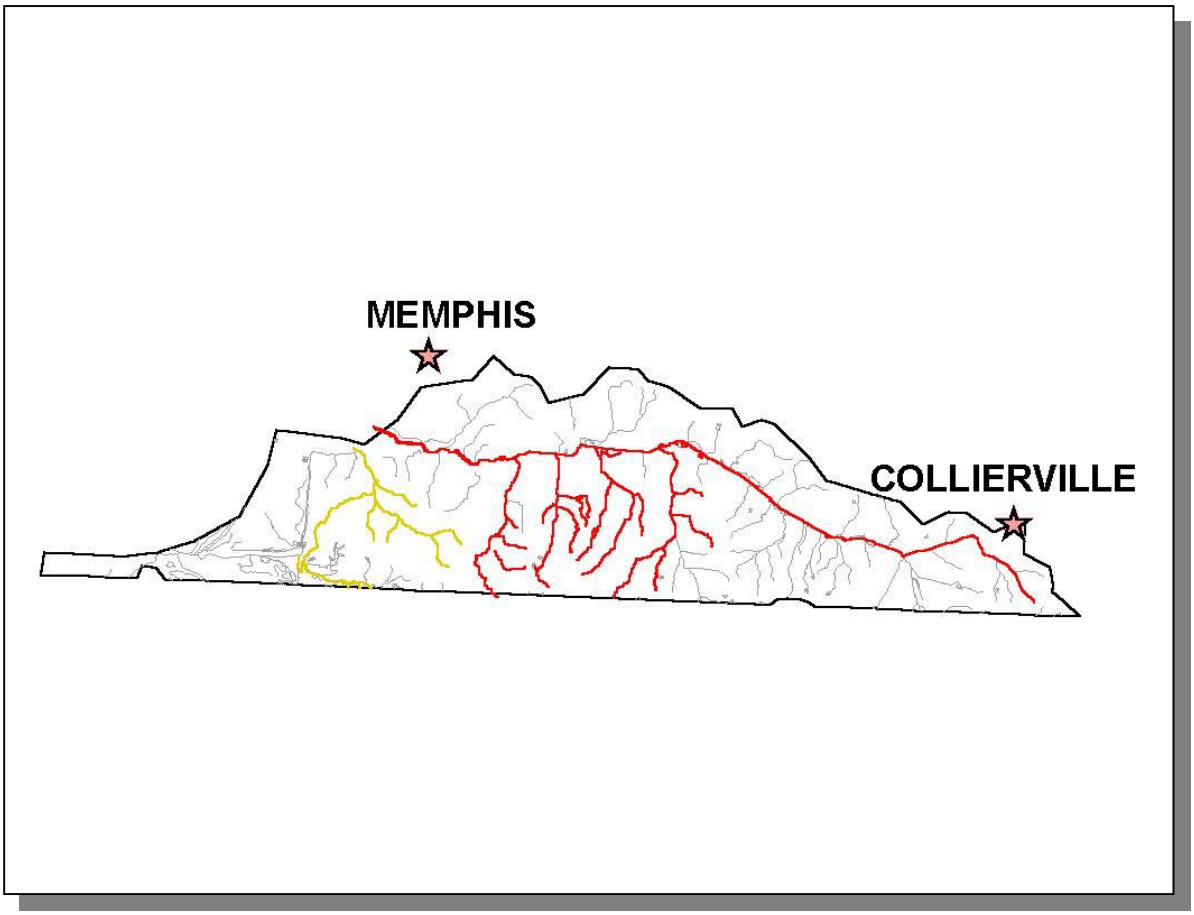

Figure 3-7c. Impaired Streams Due to Pathogens in the Nonconnah Creek Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Collierville and Memphis are shown for reference. More information is provided in Nonconnah-Appendix III.*

The listing of impaired waters that do not support designated uses (the 303(d) list) is traditionally submitted to EPA every two years. A copy of the most recent 303(d) list may be downloaded from: http://www.state.tn.us/environment/water.htm

In the year 2002 and beyond, the 303(d) list will be compiled by using EPA's ADB (Assessment Database) software developed by RTI (Research Triangle Institute). The ADB allows for a more detailed segmentation of waterbodies. While this results in a more accurate description of the status of water quality, it makes it difficult when comparing water quality assessments with and without using this tool. A more meaningful comparison will be between assessments conducted in Year 3 of each succeeding five-year cycle.